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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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2005 MARKET STREET  
PHILADELPHIA, PA 19103

EXAMINER

LEUNG, JENNIFER A

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 11/27/2002

16

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	09/357,507	TAGUCHI ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

AS-16

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-4,6,8-17 and 19-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6,8-17 and 19-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 July 1999 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 01 October 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                    | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                           | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>144</u> . | 6) <input type="checkbox"/> Other:  |

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 1, 2002 has been entered.

### *Response to Amendment*

2. The amendment filed on October 1, 2002 has been received and carefully considered. The specification and drawing changes submitted on October 1, 2002 are acceptable. Claims 2, 5, 7 and 18 are cancelled. Claims 1, 3-4, 6, 8-17 and 19-26 remain active.

### *Drawings*

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, in reference to claim 11, the "two or more reaction segments connected in parallel" must be shown or the feature canceled from the claim (the subject matter appears to pertain to the embodiment of FIG. 9, comprising segments 111 and 114, shown as connected in series via pathway 113). No new matter should be entered.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference signs not mentioned in the description: "23" in FIG. 4, "38" and "39" in FIG. 5, and "63" in FIG. 7.

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5. The drawings have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the drawings.

6. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### *Specification*

7. The abstract of the disclosure is objected to because of use of legal phraseology. Please note the use of the terms "comprising" (line 4), "comprises" (line 10) and "means" (lines 10, 11). Correction is required. See MPEP § 608.01(b).

Applicant is reminded of the proper language and format for an abstract of the disclosure:

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

8. The disclosure is objected to because of the following informalities:

- In the specification, as originally filed, on page 32, line 8, "2" should be changed to -- 102 -- for proper reference to the drawings.
- In the specification, as filed on January 18, 2002, on page 3, line 17 (regarding FIG. 4), "numeral 23" should be changed to -- numeral 24 -- for proper reference to the drawings.

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9. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification. Appropriate correction is required.

***Claim Objections***

10. Claims 4 and 23 are objected to because of the following informalities: -- material -- should be inserted before "constituting" in lines 3 and 4 for consistency and clarity in claim terminology. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 1, 3-4, 6, 8-17 and 19-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim 1, "the reformed gas pathway" (line 9) lacks proper positive antecedent basis, as it is merely recited in the intended use clause set forth in lines 4-6. See claim 21, line 9 likewise. Furthermore, it is unclear as to the structural relationship of the "reformed gas pathway" to the other elements of the apparatus.

Furthermore, it is unclear as to the structural limitation the applicants are attempting to recite by, "the reformed gas pathway formed in proximity with said catalyst bed via a partition", and what structural element constitutes the partition and where it is disclosed in the specification

and drawings. Also, it is unclear as to the structural relationship of the "partition" to the other elements of the apparatus.

Furthermore, it is unclear as to the structural relation of "an upstream side" and "a downstream side" to the other elements of the apparatus, as well as an indication of the gas flow direction. The same comments apply to the use of "upstream" and "downstream" terminology in subsequent claims (i.e. claims 3, 12, 20, 21, 22, 23).

With respect to claim 4, it is unclear as whether "said catalyst" refers to "the catalyst [material] constituting said downstream side portion" (claim 3, lines 3-4) or "the catalyst [material] constituting said upstream side portion" (claim 3, lines 4-5). Also, claims 23 and 24.

With respect to claim 6, the use of the term "capable" (line 2) renders the claim vague and indefinite, since whether or not a structural element is capable of performing a specific function does not constitute a structural limitation. See also claim 25, line 2. Furthermore, it is unclear as to the structural relationship of "a gas flow control valve" (line 2) to the other elements of the apparatus.

With respect to claim 8, the language of the claim is directed to a method limitation, which renders the claim vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by lines 2-4, as "said reformed gas" is not an element of the apparatus. Likewise, claim 26.

With respect to claim 9, it is unclear as to the structural limitation the applicants are attempting to recite by, "said reaction segment is placed outside the reformed gas pathway before passing through said catalyst bed". Also, the language of the claim is unclear, as it appears to read, "passing [said reaction segment] through said catalyst bed".

With respect to claim 10, “said flow pathway” (line 2) lacks proper positive antecedent basis.

With respect to claim 11, it is unclear as to the structural relationship of the second (or plurality) of reaction segments to the other elements of the apparatus.

With respect to claim 12, it is unclear as to the relationship of “a catalyst bed heating branch” (line 4) to the separate branches created by the bifurcation, namely “a branched pathway” and “said reformed gas pathway”. Likewise, “a catalyst bed cooling branch” (line 4).

With respect to claim 13, “said reformed gas supply path” (lines 3-4, 7) lacks proper positive antecedent basis. Furthermore, it is unclear as to whether “their connection” (line 5) refers to a single connection point of both “said reformed gas pathway” and “said branched pathway” to the “reaction segment”.

With respect to claim 14, it is unclear as to the structural relationship of the “at least a two-segmented catalyst bed” to the “catalyst bed” set forth in claim 1, line 3. Furthermore, it is unclear as to the structural limitation the applicants are attempting to recite by “uppermost”, and the relationship to the gas flow direction within the apparatus. See subsequent claims likewise.

With respect to claim 15, “the uppermost catalyst layer” (lines 2-3) and “the lowermost catalyst later” (line 3) lack proper positive antecedent basis. Furthermore, it is unclear as to the structural relationship of the “at least a two-segmented catalyst layer” to the “catalyst bed” set forth in claim 1, line 3. Furthermore, it is unclear as to the structural limitation the applicants are attempting to recite by “lowermost”, and the relationship to the gas flow direction in the apparatus. See subsequent claims likewise.

With respect to claim 16, it is unclear as to the structural relationship of "an uppermost honeycomb shaped catalyst bed" and "a lowermost honeycomb shaped catalyst bed" to the "catalyst bed" set forth in claim 1, line 3.

With respect to claim 17, "the lowermost catalyst bed" (line 3) lacks proper positive antecedent basis.

With respect to claim 19, it is unclear as to the structural limitation the applicants are attempting to recite in lines 2-3, as the language of the claim appears to read "said catalyst bed contains... means for controlling a supplying amount of said oxidant gas".

With respect to claim 20, it is unclear as to the structural relationship of "an electric heater" to the other elements of the apparatus. See also claim 22.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

12. Claims 1, 3-4, 6, 8-14, 21 and 23-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Vanderborgh et al. (U.S. 5,271,916).

With respect to claims 1 and 21, Vanderborgh disclose an apparatus comprising:



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A reaction segment 26 having a catalyst bed 30, 32 (Figures; column 6, lines 25-40);

A reformed gas inlet 18 for supplying the reformed gas to the reaction segment 26 via a reformed gas pathway (Figures; column 3, lines 59-67);

An oxidant gas supplying segment 60 for supplying oxidant to the reformed gas supply pathway (Figures; column 4, line 62 to column 5, line 41);

A cooler 20 for cooling an upstream side of said catalyst bed 30, 32 (Figures; column 5, line 55 to column 6, line 2); and

Means 42 for heating a downstream side of said catalyst bed 30, 32, wherein said means 42 is a portion of the reformed gas pathway formed in proximity with said catalyst bed via a partition 46 (Figures, best shown in FIG. 2; column 8, lines 41-63).

Vanderborgh further disclose said reformed gas pathway (i.e. at 31) at least partially surrounds said catalyst bed 30, 32 (Figures).

With respect to claims 3 and 23, Vanderborgh further disclose that an upstream side portion 30, 32 of the catalyst bed is formed of different catalyst material than that of a downstream side portion 56, and the catalyst constituting the downstream portion exerts and activity at lower temperature than the catalyst constituting the upstream side portion (column 9, lines 31-35; column 9, line 53 to column 10, line 25).

With respect to claims 4 and 24, Vanderborgh further disclose the catalyst supported by a metallic material (i.e. "metal monolith support"; column 7, lines 3-14).

With respect to claim 6 and 25, Vanderborgh further disclose a gas flow rate control valve 64 to regulate or control the addition of oxidizing gas in correspondence with a temperature of said catalyst bed (column 5, lines 6-41).

With respect to claim 8 and 26, Vanderborgh further disclose said reformed gas flows in a first direction (via conduit 19) prior to passing through said cooler 20, and passes through said catalyst layer in a second direction (via 44 and 46), wherein the first and second directions are opposing (i.e. "counterflow arrangement"; column 8, lines 41-63; Figure 2).

With respect to claim 9, Vanderborgh further disclose said reaction segment 26 placed outside the reformed gas pathway 31 or 33 (Figures).

With respect to claim 10, Vanderborgh further disclose a tube-shaped reaction segment and said flow pathway before the passage through said cooler formed around (interpreted as "near") the reaction segment (FIG. 2).

With respect to claim 11, Vanderborgh further disclose two or more reaction segments 26 and 54 connected in parallel (Figures).

With respect to claim 12, Vanderborgh further disclose a branched pathway, bifurcated downstream from the connection between said reformed gas pathway 19 and oxidant gas supplying segment 60, thereby forming a "catalyst bed heating branch" (i.e. 33) and a "catalyst bed cooling branch" (i.e. 31), where the "catalyst bed heating branch" connects to said reaction segment 26 at a middle point of said catalyst bed (where multiple beds are present, the center bed; column 6, lines 10-13), and the "catalyst bed cooling branch" connects to said reaction segment 26 at an upstream point of the catalyst bed (Figures; column 6, lines 14-24).

With respect to claim 13, Vanderborgh further disclose means 29 for changing the cross-sectional area of said reformed gas pathway 28 and said branched pathway 31, 33 at their connection to said reaction segment 26 (Figures; column 6, lines 14-24).

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With respect to claim 14, Vanderborgh further disclose a two-segmented catalyst bed 30, 32, and at least an uppermost catalyst bed 56 with low reactivity to CO (Figures; column 9, line 30 to column 10, line 5).

Instant claims 1, 3-4, 6, 8-14, 21 and 23-26 read structurally on the apparatus of Vanderborgh.

13. Claims 1, 6, 8-9, 11, 21 and 25-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Heil et al. (U.S. 5,874,051).

With respect to claims 1 and 21, Heil disclose an apparatus (FIG. 2; column 4, line 50 to column 7, line 46) comprising:

A reaction segment  $P_n$ , where  $n \geq 1$ , having a catalyst bed 5;

A reformed gas E inlet 13 for supplying the reformed gas to the reaction segment  $P_n$  via a reformed gas pathway (inlet 13, reaction chambers 2, through openings 14a, and exit 14 or 14b);

An oxidant gas supplying segment 3 for supplying oxidant to the reformed gas supply pathway;

A cooler ( $W_1$  to  $W_{n-1}$  employing  $W_1$ ) for cooling an upstream side of said catalyst bed; and

Means for heating a downstream side of said catalyst bed (via controlled CO-oxidation along the reaction path), wherein said means is a portion of the reformed gas pathway (i.e. portion 2 within segments  $P_n$ ) formed in proximity with said catalyst bed 5 via partition  $P_n$  so as to heat said catalyst bed 5 by said reformed gas before passing through said cooler  $W_n$ .

Heil further disclose said reformed gas pathway (i.e. reaction chamber 2) at least partially surrounds said catalyst bed 5.

With respect to claim 6 and 25, Heil (column 3, lines 28-38; column 6, lines 39-51; column 7, lines 18-23) further disclose a gas flow rate control valve 4 to regulate or control the addition of oxidizing gas in correspondence with a temperature of said catalyst bed.

With respect to claim 8 and 26, Heil (FIG. 2; column 4, line 66 to column 5, line 12) further disclose said reformed gas flows in a first direction (through inlet 13, by arrow E) prior to passing through said cooler  $W_1$ , and passes through said catalyst layer 5 in a second direction (through outlet 14, by arrow  $P_e$ ), wherein the first and second directions are opposing.

With respect to claim 9, Heil (FIG. 2) further disclose said reaction segment  $P_n$ , where  $n \geq 1$ , placed outside (i.e. surrounding) the reformed gas pathway.

With respect to claim 11, Heil (FIG. 2; column 6, lines 2-17, 24-38) further disclose two or more reaction segments,  $P_1, P_2, \dots P_n$ , where  $n \geq 1$ , connected in parallel.

Instant claims 1, 6, 8-9, 11, 21 and 25-26 read structurally on the apparatus of Heil et al.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. Claims 15 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanderborgh et al. (U.S. 5,271,916).

With respect to claim 15, Vanderborgh further disclose that the two catalyst beds 56 and 30, 32 may comprise different catalysts (column 9, lines 30-35) and the catalysts may be selected from "finely divided" (i.e. pelletized) metal or supported on a monolith (i.e. honeycomb) (column 7, lines 3-13). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select the catalyst pellets for the uppermost catalyst bed and a honeycomb for the lowermost bed, depending on the intended use of the apparatus and absent showing any unexpected results.

With respect to claim 19, Vanderborgh further disclose a means 64 for controlling a supplying amount of said oxidant gas according to a temperature as measured. Although Vanderborgh does not expressly state a temperature measuring apparatus segment for performing this function, the temperature measuring apparatus is intrinsic in the apparatus as illustrated by the method (column 5, lines 6-41).

15. Claims 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vanderborgh et al. (U.S. 5,271,916) in view of Hervert et al. (U.S. 3,785,781).

Vanderborgh disclose that the two catalyst beds may comprise different catalysts (column 9, lines 30-35) and the catalysts may be supported on a monolith (i.e. honeycomb) support

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(column 7, lines 3-13). Vanderborgh are silent as to whether the open area of a honeycomb lattice of the uppermost catalyst bed may be larger than an open area of a honeycomb lattice of the lowermost catalyst bed. However, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to provide the catalyst beds as such, depending on the intended use of the apparatus and absent showing unexpected results, because changes in size involve only ordinary skill in the art, as evidenced by Hervert et al. The apparatus of Hervert comprises a honeycomb catalyst support whose open lattice area is varied in size, wherein an upstream support 13 comprises a larger open area 32 of honeycomb lattice than a downstream support 14 having open area 33 (column 3, lines 47 to column 4, line 42). The variation of size, or element interfacing mismatching, improves mixing of the gas stream, as taught by Hervert (column 5, lines 9-53). In any event, it has been held that changes in size involve only ordinary skill in the art. *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955).

16. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vanderborgh et al. (U.S. 5,271,916) in view of Heil et al. (U.S. 5,874,051).

Vanderborgh further disclose that the two catalyst beds may comprise different catalysts (column 9, lines 30-35) and the catalysts may be selected from platinum and supported on high surface area ceramic supports or metal monolith supports. Vanderborgh also cite aluminum oxide supports (column 7, lines 3-13). Vanderborgh further states "other adaptations of the present invention might be required if different process temperatures are required. Selecting different catalyst systems, i.e. different catalyst formulations, may dictate varying process temperatures" (column 13, lines 24-41).

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However, Vanderborgh is silent as to whether the support may be selected from the zeolite group, and whether the uppermost catalyst bed comprises platinum on an alumina group material and the lowermost catalyst bed comprises platinum on a zeolite group material.

Although Vanderborgh is silent as to a zeolite group support, the use of zeolite as a catalyst support is well known in the art, as evidenced by Heil et al. The apparatus of Heil comprises a catalyst bed, wherein the catalyst may be selected from platinum and supported on a suitable material such as zeolite or aluminum oxide (thus indicating equivalency; column 3, lines 38-49). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select zeolite as a catalyst support. Furthermore, although Vanderborgh is silent as to the arrangement of the catalyst beds as claimed, it would have been obvious for one of ordinary skill in the art at the time the invention was made to arrange the beds as such depending on the intended use of the apparatus, absent showing unexpected results.

17. Claims 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanderborgh et al. (U.S. 5,271,916) in view of Hirota et al. (U.S. 6,029,443).

Vanderborgh are silent as to the means for heating said downstream side further comprising an electric heater. However, Vanderborgh further cite, "heat exchanger placement depends upon desired control temperatures, and therefore other physical designs may be mandated for different process conditions" (column 13, lines 24-41). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to further provide an electric heater to the means for heating said downstream side, as electric heaters are conventionally known means in the art for temperature control, as evidenced by Hirota et al. The apparatus of Hirota comprises a catalyst bed 17, wherein a means for heating (i.e. electric heater)

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26 is placed downstream of the catalyst bed 17 to allow a portion of the catalyst to be maintained at a predetermined optimal temperature range (FIG. 1; column 3, lines 58-64).

### *Response to Arguments*

18. Applicant's arguments filed on October 1, 2002 have been fully considered but they are not persuasive.

Regarding claim 1 (page 5, line 17 to page 8, line 21), applicants argue "the structural elements in claim 1 of the present application are different and nonobvious when compared to the structural elements in Heil", namely the "distinct structural advantage by using a cooler" and "the inclusion of a reaction segment 19... that separates the reformed gas from the catalyst layer 11 as it proceeds along the reformed gas pathway [shown in FIG. 3]". Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references, as the reaction segment, reformed gas pathway, and cooler of Heil meet the language of the claim.

Regarding claim 6, applicants argue "the valve in Heil and the flow rate control valve 4 of the present invention are significantly different" since the "valve in Heil is actually a metering device" and "the primary means by which the apparatus controls temperature in the reactor", whereas "the air flow rate control valve 4 [of the present invention] establishes the oxygen to carbon monoxide volume ratio" and "is not the primary means for obtaining a desired temperature profile" (page 8, line 22 to page 9, line 21). However, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the



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prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Regarding claim 8, applicants argue "the structural features of the apparatus of Heil do not enable the mixed gas and the coolant to flow in opposite directions, nor is it possible for the reformed gas to flow in a first direction prior to passing through the catalyst support units in a second direction" and "the present invention can be patentably distinguished from the prior art based on structure, not just the intended use of the invention". The Examiner asserts that the reference of Heil does teach structural features that enable the mixed gas to flow in a first direction and subsequently a second opposing direction, as illustrated in FIG. 2. In this particular embodiment, the apparatus comprises a hole 13 for conducting an educt gas stream E through the reformed gas pathway in a first direction. The apparatus further comprises a gas outlet 14, from which the product gas stream Pe exits, flowing in an opposing direction to the first direction (column 4, line 50 to column 5, line 12).

Regarding claim 9, applicants argue "Heil does not disclose a reaction segment placed outside the flow pathway before passing through the catalyst layer" and "the reformed gas does not initially heat the downstream side of the catalyst layer before passing a heat exchanger and then a reaction segment" (page 10, line 21 to page 11, line 13). The Examiner asserts that Heil do teach a reaction segment placed outside the flow pathway before passing through the catalyst layer, as illustrated in the FIG. 2. In this particular embodiment, Heil disclose a reaction segment Pn, where  $n \geq 1$ , placed outside (i.e. surrounding) the reformed gas pathway (defined as inlet 13, reaction chambers 2, through openings 14a, and exit 14 or 14b).

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Regarding claim 11, applicants argue, "the structure and design of the apparatus in Heil do not teach or suggest placing two or more reaction segments in parallel." (page 11, line 19 to page 12, line 6). However, the Examiner asserts that Heil does teach or suggest placing two or more reaction segments in parallel, as illustrated in FIG. 2. In this particular embodiment, the two or more reaction segments  $P_1$  to  $P_n$ , where  $n \geq 1$ , are connected in parallel (column 6, lines 17-38).


Regarding claims 3-4, 10, 12-17 and 19, applicant's arguments have been considered but are moot in view of the new grounds of rejection.

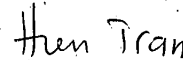
#### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is 703-305-4951. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 703-308-6824. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung   
November 21, 2002



**HIEN TRAN  
PRIMARY EXAMINER**